

XI. *An Account of the Strata observed in sinking for Water at Boston, in Lincolnshire.* By Mr. James Limbird, Surveyor to the Corporation; communicated by Sir Joseph Banks, Bart. P. R. S.

Read December 21, 1786.

ON the 7th day of May, 1783, GEORGE NAYLOR, of Louth, in the county of Lincoln, Well-borer, began to bore at the well in the Market-Place, Boston; which had been sunk and bored to the depth of 186 feet from the surface, in 1747, by THOMAS PARTRIDGE.

The well was made about 6 feet in diameter at the top, 5 feet in diameter at the bottom, and 27 feet deep, and the earth prevented from falling in by a circular frame of wood, which goes from the surface of the earth to the depth of 21 feet and 6 inches, and is there supported by brick-work, laid on a bed of light-coloured blue clay, which continues to the depth of 36 feet from the surface, where there is a bed of sand and gravel about 18 inches thick, and under it the same sort of blue clay as before, which continues to the depth of 48 feet from the surface. Below this there is a bed of dark-coloured stone, like ragstone, about six inches thick, from under which GEORGE NAYLOR says, that a salt spring issues. Beneath this layer of stone, there is a bed of dark-blue clay, which continues to the depth of 75 feet from the surface, where is a bed of stone, of a lightish colour, about 6 inches thick, and under it

a bed of dark-blue clay, which continues to the depth of 114 feet from the surface, where there is a bed of stone, of a brightish colour, about 8 inches thick, and under it a bed of gravel, about 6 inches thick, where GEORGE NAYLOR says there is another salt spring. Under the gravel, there is a bed of dark-coloured clay, resembling black-lead, which continues to the depth of 174 feet from the surface, when it changes to a chalky clay, intermixed with small pebbles and flints, which continues about 3 inches, and then changes to the same kind of dark-coloured clay as before; in which, after boring to the depth of 186 feet from the surface, he came to the solid earth bored to, in 1747, by the above-mentioned THOMAS PARTRIDGE. After boring in the same kind of clay to the depth of 210 feet from the surface, it changes to a lighter-coloured one, which continues about 6 inches, and then changes dark again, and continues so to the depth of 342 feet from the surface, where there is a bed of shells and white-coloured earth, about half an inch thick, and under it a light-coloured earth like that at 210 feet from the surface, and under it a bed of dark-coloured clay. After continuing in that clay to the depth of 444 feet from the surface, GEORGE NAYLOR put down a tin pipe, 50 yards in length, and $2\frac{1}{4}$ inches in diameter within, to prevent the gravel and stones from falling down and obstructing the rods; but being too weak for that purpose, it separated into different lengths, and intirely prevented his boring, so that he was obliged to get the said pipes up again, which took him 48 days; having got them up, and cleared the hole pretty well, he left off boring until he could procure some stronger pipes.

In July, 1784, he put down 21 pipes of cast iron, which were cast at Chesterfield, in the county of Derby, each pipe

being $2\frac{1}{4}$ inches in diameter within, half an inch thick, and upon an average 6 feet and 1 inch in length; they were affixed together with boxes and screws, and with a piece of soft leather between the top of each box and screw, to prevent them from breaking; the uppermost pipe is fastened to a plank, which lies upon the top of the brick-work.

At the distance of 447 feet from the surface there is a bed of dark-coloured earth mixed with chalk and gravel, which continues to the depth of 449 feet and 10 inches from the surface, where is a bed of dark-coloured earth without any chalk and with very little gravel, which continues to the depth of 454 feet and 7 inches from the surface; there it changes to a dark-coloured earth, mixed with chalk and gravel, which continues to the depth of 456 feet and 8 inches from the surface, and then changes to a dark-coloured earth without any chalk, and with very little gravel, which continues to the depth of 457 feet from the surface, and then changes of a lighter colour; and this continues to the depth of 462 feet and 4 inches from the surface, where it changes of a darker colour, and so continues to the depth of 470 feet and 3 inches from the surface. Here the ground changes to a dark-coloured earth, mixed with chalk and gravel, which continues to the depth of 470 feet and 7 inches from the surface, where he came to a bed of stone, like ragstone, about 13 inches thick, which ground into powder with the wimble, and mixed with the earth. Under this bed of stone there is a dark-coloured earth, without any chalk, and with but little gravel, which continues to the depth of 472 feet from the surface, when it changes something lighter, and continues so about 2 inches, where the earth appears to be mixed with chalk and gravel, and continues so for
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about 1 inch, when it changes to a black filt, having a great deal of light-coloured sand in it.

On September the 6th, 1785, GEORGE NAYLOR broke one of the screws belonging to his rods just above the top of the box, at the distance of between 92 and 93 yards from the surface; when the upper rod, having a circular head or ring 2 inches in diameter at the top, dropped down 40 yards through the iron pipes; which rods were got up again on the 15th day of September by a spring. After trying several instruments to get up the lower part of the rods, to no effect, on the 3d day of October following was contrived a spiral instrument, about 2 feet long, with a catch at the top of it, to take the bottom of the uppermost box of the rods that were down; but the top of the rods having fallen several inches from the perpendicular, prevented the instrument from taking them between the first and second boxes: therefore, the Surveyor to the Corporation and the above-mentioned GEORGE NAYLOR, on the 7th day of October, contrived a spiral instrument, about 2 feet long, without any catch at the top, which GEORGE NAYLOR put down about 10 yards below the upper box, and there taking hold of the rods, raked them up to the top, and by that means brought them perpendicular, when he left them, and on the 8th day of October put down the instrument invented before; by which he got hold of the rods a little below the top box, and brought them up. When the rods broke, GEORGE NAYLOR was boring in a dark-coloured filt, intermixed with chalk and gravel, at the distance of 474 feet from the surface, which continued to the depth of 475 feet and 5 inches, when it changed to dark-coloured wet filt without any chalk, in which GEORGE NAYLOR bored to the depth of 478 feet and $8\frac{1}{2}$ inches from the surface. Here he imagined,

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by the easy turning of the wimble, that he had got into a spring of water, and gave over boring, to see if the water would rise in the pipes ; when, after keeping the water in the well below the top of the pipes for several days (by pumping), the water in the pipes was found to rise about 5 feet *per day* upon an average ; which only producing about 7 pints, it was supposed there was no spring of water bored into, but that the rise of water in the pipes was occasioned by the soccage only.

On Monday the 28th day of November, an iron bucket was made and affixed to the bottom of the rods, and let down the pipes, and filled with water at the depth of 85 yards from the surface ; which water was salt, and of a reddish colour. The bucket was again let down, and filled at the depth of 156 yards from the surface ; that water was more salt than the first, and much of the same colour.

The Committee appointed by the Corporation for superintending the business of sinking for water, having taken the whole of these circumstances into their consideration, and examined GEORGE NAYLOR, who did not account, in a manner satisfactory to them, for the slow progress he had lately made in boring, were of opinion, that it would be proper for the present to discontinue all operations in the well ; they therefore directed the stage to be taken up, the mouth of the iron pipes to be carefully plugged up, the well to be covered with oak plank, and the ground over it to be paved as before ; all which was accordingly done.

Boston,
November 28, 1786.

JAMES LIMBIRD,
Surveyor to the Corporation.